PRODUCT FABRICATION SPECIFICATION

for the

MOLDED ELECTRICAL WIRE ASSEMBLIES

for the

BRADLEY FIGHTING VEHICLE (M2A3, M3A3) SYSTEM

19207-12465333 REVISION A

DOCUMENT DATE: 16 March 2000

CONTRACT NUMBER: DAAE07-94-C-0456

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This Product Fabrication Specification is authorized for use by The US Army Tank-Automotive Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense

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DOCUMENT TRACEABILITY MATRIX

RE	DATE	DESCRIPTION	AUTHORITY	APPROVE	
0	22 October 1998	Initial Release		-	-
A	16 March 2000	Incorporate ADCN 148820 ADCN 150110 SCN 147632 SCN 147640		R.A. J.L.	

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1. SCOPE

1.1 Scope.

This specification establishes the performance, test, manufacture and acceptance requirements for molded electrical wire assemblies, hereinafter referred to as wire assemblies.

1.2 Item definition.

A wire assembly shall be defined as any harness, cable or lead that carries electrical current from one point to another.

1.3 Classification.

Wire assemblies covered by this specification shall be of the following classes and types as specified on assembly drawings.

Type A - High temperature environment (a typical example is the enclosed engine compartment).

Type B - High abrasion environment (typical examples are bilges, at hinged openings such as hatches, near turret slip ring assemblies, and any area exposed to extreme abrasion).

Type C - Normal environments (typical examples are vehicle driver and passenger compartments).

Class 1 - Wire assemblies not requiring a protective sleeve over markings.

Class 2 - Wire assemblies requiring a protective sleeve over markings.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks.

The following documents form a part of this specification to the extent specified herein. Unless otherwise identified by an asterisk (*), the issues in effect shall be those items which are listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered as superseding requirements.

SPECIFICATIONS

Federal

A-A-870	—	Antifreeze Coolant, Engine; Ethylene Glycol, Inhibited Concentrated
A-A-52416	—	Terminals, Lug; and Splices, Conductor (Electrical Solderless, for Automotive Use)
A-A-52557	—	Fuel Oil, Diesel

P-C-437	—	Cleaning Compound, High Pressure (Steam) Cleaner
P-D-220D	—	Detergent, General Purpose
QQ-B-575	—	Braid, Wire (Copper, Tin-coated, or Silver Coated, Tubular, or Flat)

Military

MIL-I-631	—	Insulation, Electrical, Synthetic-Resin Composition, Non-rigid
MIL-PRF--2104	—	Lubricating oil
MIL-C-5015	—	Connectors, Electrical, Circular Threaded, General Specification for
MIL-H-5606	—	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordinance
MIL-R-6855	—	Rubber, Synthetic Sheets, Strips, Molded or Extruded Shapes, General Specification for
MIL-B-7883C	—	Brazing of Steels, Copper, Copper Alloys, Nickel Alloys. Aluminum, and Aluminum Alloys
MIL-T-7928	—	Terminals, Lug: Splices, Conductors: Crimp Style, Copper, General Specification for
MIL-C-13777G	—	Cable, Special Purpose, Electrical: General Specification for
MIL-I-16923	—	Insulating Compound, Electrical, Embedded Epoxy
MIL-L-21260	—	Lubricating Oil, Internal Combustion Engine, Preservation and Break In
MIL-S-22473	—	Sealing, Locking and Retaining Compound, Single Component
MIL-W-22759	—	Wire, Electrical, Flouropolymer-Insulated Copper or Copper Alloy
MIL-I-23053	—	Insulation Sleeving, Electrical, Heat Shrinkable
MIL-I-23594	—	Insulation Tape, Electrical: High Temperature, Polyetetrafluoroethylene Pressure-Sensitive
MIL-M-24041C	—	Molding and Potting Compound, Chemically Cured, Polyurethane
MIL-C-26482	—	Connectors, Electrical (Circular, Miniature, Quick Disconnect Environment Resisting), Receptacles and Plugs, General Specification for
MIL-C-38999	—	Connector, Electrical Circular, Miniature High Density Quick Disconnect (Bayonet, Threaded and Breech Coupling), Environment Resistant, Removable, Crimp and Hermetic Solder Contacts, General Specification for
MIL-L-46167	—	Lubricating oil, Internal Combustion Engine Arctic
MIL-H-46170	—	Hydraulic Fluid; Rust Inhibited, Fire Resistant Synthetic Hydrocarbon Base MIL-R-46846 — Rubber, Synthetic, heat Shrinkable

MIL-T-47012	—	Tape, Pressure-Sensitive Adhesive, Copper Foil
MIL-W-81044	—	Wire, Electric, Crosslinked Polyalkene, Crosslinked Alkene-Imide Polymer, or Polyarylene Insulated Copper or Copper Alloy
MIL-M-81531	—	Marking of Electrical Insulating Materials
MIL-C-81703	—	Connectors, Electrical, Circular, Miniature, Rack and Panel or Push-Pull Coupling, Environment Resisting
MIL-S-81824	—	Splices, Electrical, Permanent, Crimp Style, Copper, Insulated, Environment Resistance
MIL-S-83519	—	Splices, Shield Termination, Solder Style Insulated, Heat-Shrinkable, Environmental Resistance, General Specification for
MIL-C-83723	—	Connectors, Electrical, Circular, Environment Resisting

STANDARDS

Military

MIL-STD-130	—	Identification Marking of US Military Property
MIL-STD-202	—	Test Methods for Electronic and Electrical Component Parts
MIL-STD-339	—	Wiring and Wiring Devices for Combat Vehicles, Selection and Installation of
MIL-STD-810E*	—	Environmental Test Methods
MS27488	—	Plug, End Seal, Electrical Connector

HANDBOOKS

Military

MIL-HDBK-454	—	General Guidelines for Electronic Equipment

2.1.2 Other Government documents, drawings, and publications.

The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those in effect on the date of invitation for bids or request for proposal

DRAWINGS

80064-2590039	—	Connector, Receptacle, Electrical
80064-2590040	—	Connector, Plug, Electrical
00000-7723494	—	Electrical Connectors, Waterproof
19207-7982736	—	Connectors, Waterproof, Electrical
00000-7982907	—	Plug, Dummy
19207-8724762	—	Rod
19207-11663357	—	Coating, Viscous

(Copies of specifications, standards and drawings required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Non-Government documents.

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issues in effect which are DoD adopted are those listed in the issue of the DODISS on the date of invitation for bids or request for proposal. Unless otherwise indicated by an asterisk (*), the issues of documents not listed in the DODISS are the issues of the documents cited on the date of invitation for bids or request for proposal.

Aerospace Industries Association, Inc. (AIA)

NAS 1387	—	Splice, Electric, Permanent, Crimp Style, Uninsulated (class 2)

American Society of Testing and Materials (ASTM)

ASTM B733	—	Standard Specification for Autocatalytic Nickel-Phosphorous Coatings on Metals
ASTM D2000	—	Standard Classification System for Rubber Products in Automotive Systems

American National Standards Institute (ANSI)

ANSI J-STD-OO1	—	Standard Practices for Soldering of Electrical Components
ANSI/ASQC z1.4-1993*	—	Sampling Procedured and Tables for Inspection by Attributes
ANSI(NCSL)A5401-1	—	Calibration Laboratories and Measuring and Tesitng Equiptment- General Requirements

International Standards Organization (ISO)

ISO10012-1	—	Quality Assurance Requirements for Measurement Equiptment- Part q Meteorological Confirmation System for Measuring Equiptment, First Edition

Proprietary

TMS	—	Thermofit Marking System

Copies of this document may be obtained from:

Raychem Corporation
300 Constitution Drive
Menlo Park, California 94025

2.3 Order of precedence

In the event of conflict between references cited herein and the contents of this specification, the contents of this specification shall be considered as superseding requirements. In the event of a conflict between this specification and a derived assembly drawing, the drawing shall prevail. No requirement or citation of this document shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article.

Unless otherwise specified (see 6.2) , the manufacturer shall deliver harness or cable assemblies which shall be subjected to first article inspection (see 4.4) to demonstrate the

adequacy and suitability of the manufacturer's processes and procedures in achieving the performance inherent in the design. First article inspection samples, properly marked with identifying information shall be representative of the production units to be delivered per the applicable contract. All subsequent harness or cable assemblies delivered per this same contract shall conform to the inspection samples in all of their pertinent physical and performance attributes.

3.2 Materials.

Unless otherwise specified, materials selected shall be uniform in quality and free from defects or imperfections. No parts or materials shall contain cadmium. Materials used in construction of wire assemblies shall not support fungal growth.

3.2.1 Wire and cable.

Wire and cable shall be selected for compliance with the safety requirements of paragraph 3.3.1 and environmental requirements of paragraph 3.4.5. The color MIL-W-22759 wire which is encapsulated by an outer covering is at the discretion of the vendor.

3.2.2 Shrink sleeving.

Unless otherwise specified on the applicable assembly drawing, tubing material over type A internal wire and wire groups shall be per MIL-I-23053/8 or MIL-I-23053/13.

Unless otherwise specified on the applicable assembly drawing, tubing material over type B or C internal wire and wire groups shall be per MIL-I-23053/1 (class 2), MIL-I-23053/16 or MIL-R-46846 (type III, class 1).

3.2.3 Adhesives, sealants and filler tapes.

Selection and use of sealants, adhesives or filler tapes are at the option of the manufacturer for the purpose of providing mechanical strength, environmental isolation or spatial positioning as required to ensure that the harness assembly shall comply with the environmental requirements herein. Neither the material selected nor its application process shall degrade the performance of the adjacent wire or cable insulation. These materials shall not be used for electrical insulation.

3.2.4 Tape binding.

Unless otherwise specified on the applicable assembly drawing, harness branches and branch transitions shall be wrapped with tape per MIL-I-631, type G (mylar), or MIL-I-15126, Type GFT. Shrink sleeving per 3.2.2 or tape per MIL-I-23594, class 1 may be used within three inches of the entry to connectors backshells or transitions.

3.2.5 Connector backshells for metal connectors.

Unless otherwise specified on the applicable assembly drawing, connector backshell material shall comply with the requirements of the following specifications:

a. Base material shall be aluminum per optional specifications:
   (1) QQ-A-225/8, temper optional
   (2) QQ-A-250/11
b. For desired features and shape, sections shall be joined by dip-brazing per MIL-B-7883C, Type V, Grade B
c. All surfaces shall be electroless nickel plated, .0005 minimum thickness,
   Class 4 or 5, Type I, Spec. ASTM B733 or the vendor may choose a different outer plating if it matches that of the connector upon approval of United Defense of a material and plating specification.

3.2.6 Metal connector backshell potting compound.

Material shall comply with the performance requirements of one of the following optional specifications:

a. MIL-M-24041C, category a.
b. MIL-I-16923, type b, c or d, except catalyst and viscosity modifiers optional.

3.2.7 Shielding.

Unless otherwise specified on the applicable assembly drawing, cable component and harness overall shield shall be a single layer of tinned copper braid sleeving per QQ-B-575, form R (tubular sleeving), or conformally applied woven tinned copper braid which complies with the fabrication requirements of QQ-B-575, form R (tubular sleeving).

3.2.8 Outer covering.

The material used to encapsulate the harness segments, transitions and metal connector backshells shall be polychloroprene (neoprene) according to the following optional specifications:

a. 2BC510A14B14C12EO34F17, SPEC. ASTM D2000
b. MIL-R-6855, class 2, type a, grade 60, color black, having a 95 percent minimum polychloroprene base polymer.

For the covering of the harness segments between transtions, backshells and cable ends, shrinkable, polychloroprene tubing per MIL-R46846. Type 1 may be used on bundles over .875" diameter, with a 2:1 shrink maintaining a minimum wall thickness of .050".

3.2.9 Resistance to solvents.

Materials shall be selected which are resistant to solvents in Table I.

TABLE I — Solvents

Fluid type	Specification
Hydraulic	MIL-H-5606
Hydraulic	MIL-H-46170
Lubricating oil	MIL-PRF-2104
Lubricating oil	MIL-L-46167
Preservative oil	MIL-L-21260
Antifreeze	A-A-870
Fuel	A-A-52557
Cleaning solution	P-C-437, Type II
Cleaning solution	P-D-220D

3.3 Design and construction.

Components and subassemblies shall be fabricated and assembled into a complete wire assembly in accordance with drawings and specifications listed or referred to on an applicable assembly drawing or herein.

3.3.1 Safety.

Conductors in a power carrying circuit with a long length shall be sized to ensure that the feeding circuit breaker will open in the event of a short at the equipment power input. The

selection of wire size shall allow for the return path voltage drop, the characteristic of the circuit breaker and the worst case initial wire temperature. Unless otherwise specified on an assembly drawing, using wire multiples for increasing circuit current carrying capacity shall be avoided.

3.3.2 Dimensional and angular tolerances.

Unless otherwise specified on an assembly drawing, dimensional tolerances shall be as specified in TABLE II and angular tolerances shall be +/- 5 degrees.

TABLE II — Dimensional tolerances.

total length (inches) per assembly drawing		tolerances (inches)
over	including	-0.00
0.00	2.00	+0.50
2.00	12.00	+1.00
12.00	50.00	+2.00
50.00	100.00	+2.50
100.00	200.00	+3.00
200.00	UP	+4.00

3.3.3 Manufacturing processes.

3.3.3.1 Lay pattern for wires, internal cables and fillers.

The lay pattern for wires, internal cables and fillers shall be per MIL-STD-339 (AT) paragraphs 600.3.8 through 600.3.10.

3.3.3.2 Wire marking.

Wire or cable marking within harness assemblies is not required.

3.3.3.3 Assembly markers and marking.

3.3.3.3.1 Marker classification.

Class 1 - Markers shall comply with requirements as stated herein.

Class 2 - Markers shall comply with requirements as stated herein and shall have a clear protective heat shrink tubing per MIL-I-23053/8 or MIL-I-23053/12 applied over the marking. After installation, tubing shall extend 0.06 to 0.50 inch beyond each end of the marker

3.3.3.3.2 Marking method.

Marking method is at the option of the manufacturer. Markings shall be affixed on the harness outer covering. Characters shall be at least 0.05 inch high and placed as shown on the applicable assembly drawing. In the case of assemblies greater than 0.40 inch in diameter, duplicate marking shall be located approximatelly 180 degrees opposed, but at least + 120 degrees away from the other marker, or if more than one duplicate set so the marking can be viiewed from all directions.

3.3.3.3.3 Marking durability.

Markings shall remain legible after exposure to all environments specified herein. Marking method and materials shall retain a legible marking after testing per MIL-STD-202, Method 215 with solvents per Table I.

3.3.3.3.4 Part identification marking.

Part identification shall be in accordance with MIL-STD-130 and as specified on assembly drawing. Part identification markings shall include serial number assigned by the manufacturer. Serial numbers shall be sequentially assigned starting with a number 0001. The manufacturer shall maintain records of the serial number assigned. On future procurements, serial numbers shall be assigned sequentially from the last number recorded.

3.3.3.3.5 Designation and destination markings.

Plugs and receptacles shall be marked within three inches of harness/cable backshell entry or termination if a lug terminal measure from the center of the, which ever is appropriate, with the applicable reference designation and/or destinations as specified on the assembly drawing. Long backshells may be marked on the backshell covering.

3.3.3.3.6 Use if Wrap-around Markers

If a wrap-around marker is used to label the harness during manufacture, then it shall be covered with a cylindrical wrap of 3M 8672 Polyurethane Protective Tape, 1.5 wraps (± .25 wrap tolerance) around the harness branch. The tape shall extend .5" ± 2" beyond each end of the label.

3.3.3.4 Soldering.

Either of the following documents shall be used as a guideline for soldering material selection and processes:

a. ANSI J-STD-OO1, CLASS 3
b. MIL-HDBK-454, GUIDELINE 5

Maximum wicking from the end of the termination shall be as specified in Table III.

TABLE III — Wicking

Wire Size (AWG)	Maximum Amount of Wicking
22, 20, 18, 16, 12, 8	2 wire diameters
4, 0	1 wire diameter
00, 000	1.5 wire diameter

3.3.3.5 Wire stripping.

The wire strands shall be neat and clean. The maximum allowable number of nicked or severed strands shall be as specified in TABLE IV. For wire termination's at crimp or solder wells, the wire shall be stripped to allow the conductor to end one wire diameter or less past the well for a feedthrough well and the wire insulation shall end within one conductor diameter away from the well entry.

TABLE IV — Maximum number of damaged strands.

Number of Strands in Wire	Allowable Maximum Number of Nicked or Severed Strands
1 to 6	0
7 to 15	1
16 to 18	2
19 to 25	3
26 to 36	4
37 to 40	5
over 40	6

3.3.3.6 Splicing.

Unless otherwise specified on the assembly drawing, splices shall meet the following requirements:

a. Wire joining materials and/or methods are optional, and shall comply with the tensile strength and voltage drop requirements of 3.3.3.11.2.
b. Splices shall be located, as indicated by the assembly drawing, either entirely within a transition, connector backshell, or in the harness segment. Splices to be located in the harness segment shall not be located within one inch from the entry to a connector backshell or transition mold.
c. Any splice, not individually insulated, shall be covered with shrink sleeving (see 3.2.2) as required to prevent contact with other conductive parts of the harness assembly.
d. Splices grouped together in a harness segment shall be placed in staggered locations to minimize the increase to harness segment diameter.

3.3.3.7 Cable component shield terminations to metal backshells.

Internal cable shields that are shown to be electrically common with the adjacent connector backshell shall be terminated individually or by group as indicated on the applicable wiring diagram. Electrical connection to the backshell shall use an extension of the internal shield braid or equivalent gage of stranded wire. Unshielded conductor length and shield length to the backshell bond point shall be minimized.

Where low level signals are identified on the harness drawing with a hex note, the shields shown to be electrically common with the adjacent connector backshell shall be terminated directly (no “daisy chain”) to the backshell at the same location as the area of contact for the overall shield braid.

3.3.3.8 Circular metal shell connectors.

Circular metal shell connectors shall be assembled according to their respective specifications. Sealing plugs selected in accordance with TABLE V or equivalent, shall be installed in each unwired grommet hole.

TABLE V — Electrical connector sealing plugs.

Connector Type	Reference Document	Plug
Circular resilient	7982736	7982907
	7723494	8724762

Circular metal shell	MIL-C-5015 MIL-C-26482 MIL-C-38999 MIL-C-81703 MIL-C-83723	MS27488

At least 70% of all insert holes will be filled with contacts, the remaining unused contacts may have filler plugs. When twinaxial or coaxial contacts are used in the connector, a solid contact cannot be used as a filler in an unwired insert hole of the same size.

3.3.3.9 Circular metal shell connector backshells.

3.3.3.9.1 Circular metal backshell design:

Circular metal shell connectors shall have a metal backshell which is fastened with an appropriate threaded coupling ring which prevents rotation after assembly. The backshell shall also have a cable entry opening with a length of neck, knurled or textured, to accommodate fastening of internal cable shields and a single or double layer overall shield braid. The outside diameter of the backshell coupling ring shall not exceed the outside diameter of the connector coupling ring.

One or more potting holes are allowable with a maximum diameter of .130” covered with metallic tape per MIL-T-47012. Potting holes shall be located in an area that will be covered by the backshell molding.

3.3.3.9.2 Circular metal backshell assembly:

Threaded backshell parts shall be assembled with thread-locking compound per MIL-S-22473, Grade H, Grade HV or coating compound 11663357 (#VC-3, a part number of N-D Industries, FSCM 04866).

a. For connectors MS3470L through MS3476L and MS3450L through MS3455L, torqued to the values shown in Table VI.
b. For connectors not addressed herein, torque as required by the connector’s specification, or if no requirement is cited, use hand and finger pressure only

TABLE VI — Torque requirements

Circular Metal Shell Connector	Shell Size	Torque (-0, +5 in-LB)
MS3470L, MS3471L, MS3472L, MS3474L, MS3475L, MS3476L (MIL-C-26482, Series II)	8	20
	10	25
	12	35
	14-18	40
	20-24	45
MS3450L, MS3451L, MS3452L, MS3456L (MIL-C-5015)	8S	18
	10S	22
	10SL, 12S, 12	24
	14S, 14	28
	16S, 16	30
	18-22	36
	24	42
	28-40	48

The use of nylon potting forms supplied with MS 25183 connectors is at the option of the vendor. They may be used to prevent abrasion with the metal backshells, but should not interfere with shield connections.

3.3.3.9.3 Clocking:

Straight Backshells shall not have a specific clocking unless otherwise indicated on the applicable drawing. Clocking for angular backshells shall be per 3.3.2.

3.3.3.10 Circular resilient connectors.

Circular resilient connectors shall be as specified on the assembly drawing. Care must be employed during assembly to retain the connector sealing characteristics since non-sealed connectors are not acceptable. For 2590039 and 2590040 connectors, crimped pins and sockets must be assembled into the connector body either dry without the aid of lubricants or with the aid of tap water as a lubricant. No other assembly method is allowed, and if water is used, the connector must be dried immediately after assembly. Sealing plugs selected in accordance with or equivalent, shall be installed in each unwired grommet hole.

3.3.3.11 Crimped electrical connections.

3.3.3.11.1 Crimping tools and workmanship.

Crimps shall be made with MS tooling matching the MS part being crimped or with the part manufacturer's recommended or required tool. Insulated crimped parts shall have no cracks and no tool inflicted damage (holes, tears or cracks). For stranded wire, all strands shall be enclosed in the crimped joint, and no loose strands shall be allowed. Crimped parts with or without integral sleeves shall be rated for a 150 degrees C or higher thermal environment.

3.3.3.11.2 Pull (tensile) strength and voltage drop.

3.3.3.11.2.1 Pull strength and voltage drop.

Manufacturer shall use optional wire joining materials and/or methods that comply with the tensile strength and voltage drop requirements of TACOM-CID A-A-52416. Samples shall be

used to perform test. The samples shall be made by the same operator, using the same process, technique and tooling as the delivered item. Connections incorporating 22 and 24 AWG wire shall comply with the values shown in Table VII as applied to the test conditions of TACOM-CID A-A-52416.

TABLE VII — 22 and 24 AWG wire voltage drop & mechanical strength requirements

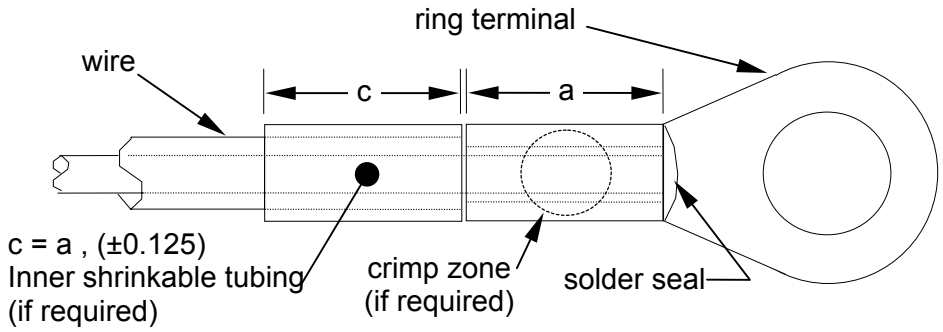
Requirement	Value for 24 AWG	Value for 22 AWG
Test current	3.5 ampers ± 5%	5 amperes ± 5%
Maximum voltage drop (initial)	0 millivolts	7 millivolts
Maximum voltage drop (after test)	15 millivolts	12 millivolts
Minimum mechanical strength	8 pounds	10 pounds

3.3.3.11.3 Ring terminals.

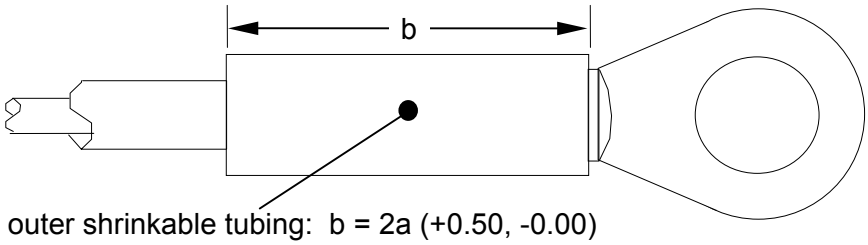
Unless otherwise specified on the applicable assembly drawing, terminals used on types A, B, and C assemblies shall be in accordance with Figure 1.

Figure 1.

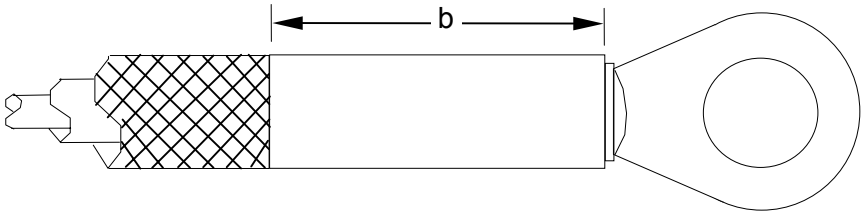
Step 1. Install ring terminal (“a” is the crimp barrel length)



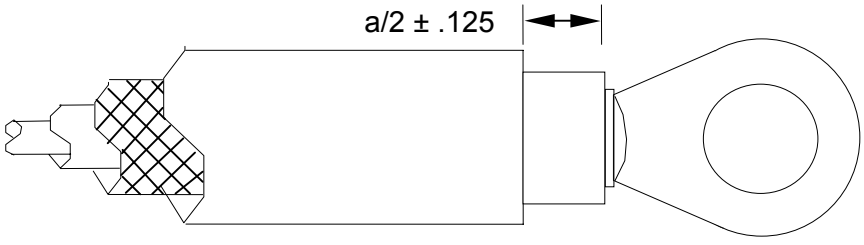
Step 2. Install outer shrink tubing



Step 3. Install/reposition harness shield braid



Step 4. Install harness outer covering



The shrink sleeving usage in Figure 1, steps 1 and 2 is specified in Table VIII.

TABLE VIII — Shrink sleeving for wire and terminals

Wire gauge	Inner tubing	Outer tubing
12 and smaller	*	*
8 and larger	Not Required	*

*Vendor shall select tubing size as required for conformal fit. Tubing material over wire assembly types B or C shall be per MIL-I-23053/1 (class 2),MIL-I-23053/16 or MIL-R-46846 (type III, class 1). Tubing material over wire assembly type A shall be per MIL-I-23053/8 or MIL-I-23053/13.

3.3.3.12 Workmanship.

Uniformity of shapes, dimensions and performance shall permit interchangeability of units of the same type and design. There shall be no protrusions, sharp edges, dents, cracks, breaks, chips, loose solder connections, broken strands, discontinuity of shielding or jacket, or any other defect that would render the unit unsuitable for the purpose intended. Workmanship shall also be in accordance with MIL-HDBK-454, guideline 9.

Undimentioned details of the drawing are left to vendor as long as they do not violate criteria in this or other referenced documents.

3.3.4 Construction Sequence.

Unless otherwise specified on the applicable assembly drawing, the harness shall be constructed in sequence as follows:

3.3.4.1 Performance characteristics. Forming Cable Bundles

Select the cable components specified and lay them up into a cable core

3.3.4.2 Machine Twisted Cable

a. Lay the components into a cable core by uniformly twisting them helically or, if more than one layer, contrahelically on a cable machine equipped with a non-distortion, tension free device to prevent back-twist of the conductors. The lay pitch shall not allow the lay to exceed 12 times the core diameter of the cable. Fillers, in accordance with 3.3.3.1 shall be used as necessary to assure a firm round core.

3.3.4.3 Manually Twisted Cable

Manually lay the components into a cable core by twisting them helicallly or , if more than one layer, contrahelically. There is no a roundness requirement unless within 4 inches of transitions or cable ends. The lay pitch shall not allow the lay to exceed 12 times the core diameter of the cable.

3.3.4.4 Breakouts

Cable leg breakouts as required, shall be formed in accordance with the applicable assembly drawing.

3.3.4.5 Shield Termination

Cut the finished segment ends to the length required and terminate them at the connector contacts. Internal cable shields that are schematically shown to be electrically common with the adjacent end connector backshell shall be terminated individually or by group as indicated in the wiring diagram. Electrical connection to a metal backshell shall use an extension of the internal shield braid or equivalent gage of stranded wire. Unshielded conductor length and shield lead length to the backshell bond point shall be minimized.

3.3.4.6 Binder Tape

3.3.4.6.1 Machine Twisted Cables

Uniformly apply to the cable core a tape binder in accordance with 3.2.4. Tape applied along harness branches shall provide a 40% minimum to 100% maximum overlap. Tape applied on harness branch transitions shall provide a 40% minimum overlap. Tape wraps ending at metal backshells shall extend 0.25 inch or more into the backshell of the connector. Protruding folds shall be minimized.

3.3.4.6.2 Manually Twisted Cables

The bundles shall be taped every 8 inches with a self adhesivie tape per MIL-I-23594, class 1, using 2 circular wraps of tape at least .0.50 inch wide. Within 4 inches of the bundle ends the cables shall be round, in accordance with 3.3.3.1 shall be used as necessary to assure a firm round core Tape applied on harness branch transitions shall provide a 40% minimum overlap. Tape wraps ending at metal backshells shall extend 0.25 inch or more into the backshell of the connector. Protruding folds shall be minimized.

3.3.4.7 Backshell Potting

Connector backshell shall be filled with potting compound per paragraph 3.2.6.

3.3.4.8 Overall Shield Braid

Overall shield braid per paragraph 3.2.7 shall be applied as a conformal layer over all harness segments and branch transitions. Where termination to a metal backshell per 3.3.3.9 is indicated, the termination shall be secured by a suitable method for assuring a permanent circumferential electrical joint.

3.3.4.9 Harness Outer Covering

Harness branches, branch transitions and connector backshells shall be covered with a conformal and contiguous layer of the same elastomer material. Harness branches shall have a 0.050 minimum to 0.105 maximum wall thickness. Harness branch transitions and connector backshell covering shall have a 0.060 minimum wall thickness. For each connector, unless otherwise noted, the outside diameter of the backshell including covering shall not exceed the specified outside diameter of the coupling ring by more than 0.100”. Fillets from molded transitions and backshell molds shall not extend more than 0.25 inches from the ends of a transition or backshell and shall not be considered as part of the overall length of a harness transition.

3.4 Performance characteristics

3.4.1 Continuity.

The wire assembly shall be electrically continuous between terminations as specified on assembly drawing.

3.4.1.1 Direct Current (dc) resistance.

Maximum allowable dc resistance between end-to-end connections for each conductor shall be as specified in Table IX. When internal cable component shields are terminated between any two connector shells, the dc resistance between these connector shells shall not exceed 2.0 ohms.

TABLE IX — Direct current resistance.

Wire Size (AWG*)	Resistance (milliohms)	Wire Size (AWG*)	Resistance (milliohms)
24	2000	8	500
22	2000	4	500
20	2000	0	100
16	1000	00	100
14	1000	000	100
12	500		

* AWG: American Wire Gage

3.4.1.2 Shield electrical bond.

Cable or harness overall shields electrically bonded to a connector backshell shall have a bond resistance of 0.0015 ohm maximum when measured from a point on the backshell in the area of the clocking ring to a point on the shield between 0.5 inches and 1.5 inches from the location of the electrical bond.

3.4.2 Insulation resistance.

Unless otherwise specified on the assembly drawing, insulation resistance of the wire assembly shall be 90 megohms minimum, except the insulation resistance of a shielded conductor shall be not less than 30 megohms.

3.4.3 Dielectric strength.

Wire assemblies shall withstand a voltage of 500 +/- 50 volts root-mean-square (RMS) at 60 hertz or 475 +/- 25 volts dc for five seconds with no evidence of arcing or breakdown.

3.4.4 Minimum bend radii.

Unless otherwise specified on the assembly drawing, minimum bend radii of wire assemblies shall be as follows:

a. Bend radii formed from straight sections of the wire assembly shall be equal to or less than 10 times the outside diameter of the assembly.
b. At terminals, or where suitably supported, the minimum bend radius may be reduced to three times the outside diameter of the wire assembly.
c. If required, the wire assembly may be enclosed in insulating sleeving and a minimum bend radius of twice the outside diameter of the wire assembly used.
d. Unless otherwise specified, the minimum bend radius for coaxial cables shall be 10 times the outside diameter and the bend shall not affect the operating characteristics of the cable.

3.4.5 Environmental conditions.

3.4.5.1 Low temperature.

Wire assemblies shall demonstrate no performance degradation and show no evidence of damage or deformation when subjected to a low temperature test in accordance with MIL-STD-810, method 502.1, procedure II. The lowest operating temperature shall be -60 degrees Fahrenheit (-51 degrees C)).

3.4.5.2 High temperature.

Wire assemblies shall demonstrate no performance degradation and show no evidence of damage or deformation when subjected to a high temperature test in accordance with MIL-STD-810, method 501.1, procedure II. Conductor sizes within wire assembly types A, B and C shall be selected according to MIL-STD-339, par. 100.3.3.6 as required by the operational load profile of each conductor and adjacent conductors. Wire assembly type A shall perform as required herein at an ambient temperature of 300 degrees F (149 degrees C). Wire assembly types B and C shall perform as required herein at an ambient temperature of 160 degrees F (71 degrees C).

3.4.5.3 Steam and water-jet cleaning.

Wire assemblies shall show no evidence of damage or deterioration and shall demonstrate no performance degradation following a steam and water-jet cleaning process which uses a cleaner conforming to P-C-437, P-D-220 or commercial equivalent. The steam and water shall be applied by jet, perpendicular to the wire assembly surface, at such a rate that the entire surface is subjected to the jet for one minute. The steam shall be applied from not more than one foot at a pressure of 105 +/- 5 psig. The water shall be applied from not more than three feet at a pressure of 50 +/- 5 psig.

3.4.5.4 Leakage (liquid immersion).

Wire assemblies shall meet the requirements of MIL-STD-810E, Method 512.3, Leakage (immersion), Procedure 1, basic Leakage. Wire assemblies shall limit water entry and shall demonstrate no performance or physical degradation after immersion in water to a depth of 1 meter for 2 hours.

3.4.5.5 Mechanical endurance.

3.4.5.5.1 Impact, bend and twist endurance.

Type C harnesses (Applicable to harnesses terminations connected to Handstations, System Control Box, MMU, Flat Panel Display, and Sight Control Panels), with connectors mated and cable runs fastened and formed to simulate installation configuration, shall demonstrate no performance or physical degradation after testing in accordance with MIL-C-13777, paragraph 4.5.4.1.1.

3.4.5.5.2 Cold bend endurance.

Type C harnesses (Applicable to harnesses terminations connected to Handstations, System Control Box, MMU, Flat Panel Display, and Sight Control Panels), with connectors mated and cable runs fastened and formed to simulate installation configuration, shall demonstrate no performance or physical degradation when tested after 4 hours of continuous manipulation at -51°F (-46°C) in accordance with MIL-C-13777, paragraph 4.5.4.1.2 (conductor removal and test not required).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

Unless otherwise specified (see 6.2d), the supplier shall be responsible for the performance of all inspections specified herein. The supplier may utilize his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the procuring activity. The procuring activity reserves the right to witness or perform any of the inspections set forth in this specification.

4.1.1 Manufacturing and inspection facilities.

The supplier shall ensure that manufacturing and inspection facilities are adequately maintained, and suitable for manufacture of the wire assemblies.

4.1.2 Measuring and Test Equipment.

Measuring and test equipment shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspections. Test and measuring equipment shall be calibrated in accordance with ISO 10012-1 or ANSI (NCSL)Z540-1.

4.1.2.1 Measurement Compensations.

Should any measurements compensations (due to associated test equipment circuitry and/or test conditions) be required to obtain the circuit input/output values as stated herein, the supplier shall provide the procuring activity with a statement of the condition and its solution.

4.2 Classification of Tests and Inspections.

Inspection of the wire assemblies shall consist of the following:

a. Materials and manufacturing processes inspection (see 4.3).
b. First article inspection (see 4.4).
c. Quality conformance inspection (see 4.5).

4.3 Materials and Manufacturing Processes Inspection.

Materials and processes inspection shall consist of certification supported by verifying data that the materials and processes used in manufacture conform to 3.2 and 3.3. The supplier shall maintain material traceability and provide certification 4.5.1). Certification shall consist of:

a. Materials in accordance with applicable assembly drawings.
b. Soldering in accordance with paragraph 3.3.3.4.

4.4 First article inspection.

Unless otherwise specified (see 6.2c, 6.2h), the supplier shall perform first article inspection on wire assemblies that have been produced with equipment and procedures used in production under cognizance of the procuring activity. Whenever a change is made in the design, manufacturing processes, procedures or facility location, the procuring activity shall be notified to determine whether the supplier must requalify for first article approval. First article approval is valid only on the contract under which it is granted unless extended by the procuring activity to other contracts. First Article inspection may be validated by comparison to similar articles currently in production, when specified by the procuring activity.

4.4.1 Sample size.

Two wire assemblies from the first wire assemblies produced shall be subjected to first article inspection.

4.4.2 Inspection routing.

The first article samples shall be subjected to the inspections specified in Table XI.

TABLE XI — First Article Inspection

Inspection	Requirement Paragraph	Inspection Method	Sample	
			1	2
100% inspection	---	table XII	X	X
Lot-by-lot sampling	---	table XIII	X	X
In-process Inspection	---	table XV	X	X
Quality Control Test	---	table XVI	X	X
Dielectric strength	3.4.3	4.6.3	X	X
Minimum bend radii	3.4.4	4.6.4		X
Low temperature	3.4.5.1	4.6.5.1	X	
High temperature	3.4.5.2	4.6.5.2	X	
Steam and water-jet cleaning	3.4.5.3	4.6.5.3	X	X
Leakage (liquid immersion)	3.4.5.4	4.5.6.4	X	
Impact, bend and twist endurance	3.4.5.5.1	4.6.5.5.1		X
Cold bend endurance	3.4.5.5.2	4.6.5.5.2		X

4.4.3 Failure.

Inability of any of the first article samples to pass any examination or test of the TABLE XI shall constitute a failure. Such failure may, at the option of the procuring activity, be cause for refusal to allow additional examinations or tests until causes of faults have been corrected and the corrective action approved by the procuring activity. Failure of a sample to pass any examination or test shall be cause for refusal to grant first article approval.

4.4.4 Disposition of sample.

Samples which have been subjected to first article inspection shall not be delivered as new equipment under the contract.

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery.

Inspection of harness assembly delivery shall consist of 100 percent, lot-by-lot sampling and in-process inspections.

4.5.1.1 100 Percent Inspection .

100 percent inspection shall consist of the inspections so indicated in Table XII.

TABLE XII — 100 Percent Inspection.

Inspection	Requirements Paragraph	Inspection Method
Continuity	3.4.1	4.6.1
dc resistance	3.4.1.1	4.6.1.1
Shield electrical bond	3.4.1.2	4.6.1.2
Insulation resistance	3.4.2	4.6.2

4.5.1.2 Lot-by-Lot Sampling Inspection.

Lot-by-lot sampling inspection shall consist of the inspections so indicated in Table XIII.

TABLE XIII — Lot-by-Lot Sampling Inspection.

Inspection	Requirement Paragraph	Inspection Method	Classification of Defects	
			Major	Minor
Completeness of assembly	3.3	4.6.6	X	
Dimensions	3.3.2	4.6.6.1		X
Outer covering	3.2.8	4.6.6.2	X	
Ring terminals	3.3.3.11	4.6.6.4	X	
Circular metal shell connectors	3.3.3.8	4.6.6.5	X	
Circular resilient connectors	3.3.3.10	4.6.6.6	X	
Identification marking*	3.3.3.3	4.6.6.13		X
Workmanship	3.4.6	4.6.6.14		X

* Wire marking inspections (3.3.3.2) not required for first article testing.

4.5.1.2.1 Lot-by Lot sampling plan.

a. Basic method. Quality characteristics so listed in Table XIII shall be inspected using the (C=O) sampling plan shown in Table XIV or an equivalent found in ANSI/ASQC Z1.4. Alternate sampling plans are not allowed except under an approved statistical process control (SPC) system conforming to the requirements outlined in paragraph 4.5.1.2.1

b or unless approved by the procuring activity.

(1) Tightened Inspection. Tightened inspection shall be introduced as soon as 2 out of 5 successive lots have been rejected and shall as a minimum, impose a 30% increase in sample size. Normal inspection sampling may be restored after 5 successive lots have been accepted under tightened inspection.

(2) Reduced Inspection. Reduced inspection may be introduced when 10 successive lots have been accepted and shall as a maximum, permit a 30% decrease in sample size. Normal inspection sampling shall be restored if a lot is not accepted under reduced inspection.

(3) Lot. A lot is defined as a collection of parts produced under essentially the same conditions and offered for inspection at one time.

(4) Rejected Lot. A rejected lot may be 100 percent sorted (screened) to remove nonconforming parts and to determine acceptance of conforming parts.

TABLE XIV — Lot-by-Lot Sampling Plan.

Lot size	Sample size	
	For major characteristics	For minor characteristics
2 to 13	Entire lot	3
14 to 25	13	3
26 to 50	13	5
51 to 90	13	6
91 to 150	13	7
151 to 280	20	10
281 to 500	29	11
501 to 1200	34	15
1201 to 3200	42	18
3201 to 10,000	50	22

NOTE: Accept lot on zero defects. Reject lot on one or more defects.

b. Statistical Process Control (SPC) Sampling Method. Sampling plan requirements of 4.5.1.2.1a. may be satisfied through the use of SPC as an alternate control method. An SPC plan detailing the methods for monitoring process control shall be approved by the procuring activity or agent. The plan, developed by the supplier, shall include as a minimum:

(1) Types of control charts and their uses.

(2) Process capability (Cpk) studies.

(3) Criteria for determining out-of-control conditions.

(4) Corrective actions to be taken if an out-of-control or out-of-tolerance condition is detected.

(5) Training programs and qualification requirements of personnel executing the plan.

(6) Provisions for reduced inspection.

The plan shall contain the results of process capability studies for the process being controlled. For variable data, the minimum Cpk for statistical control should be 1.33. For attribute data, a minimum process average of 99.73 percent is required.

4.5.1.3 In-process inspection.

In-process inspections during manufacture of the wire assemblies shall be as specified in Table XV. The inspections shall be accomplished at the appropriate stage(s) in the manufacturing process which will allow for a comprehensive examination of the assembly without removing previously assembled components.

4.5.1.3.1 Sampling plan.

Statistical sampling and inspection shall be in accordance with 4.5.1.3.1 a and b.

4.5.1.3.2 Rejected lots.

If an inspection lot is rejected, the supplier may rework to correct the defects or screen out the defective wire assemblies and submit for re-inspection. Rework shall conform to drawing and specification requirements. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separated from new lots and shall be clearly identified as re-inspected lots.

TABLE XV — In-process inspection.

Inspection	Requirements Paragraph	Inspection Method
Sealing plugs (installed)	3.3.3.8	Visual
Crimping	3.3.3.11	4.6.6.7
Soldering	3.3.3.4	4.6.6.8
Wire stripping	3.3.3.5	4.6.6.9
Splicing	3.3.3.6	4.6.6.10
Shield termination	3.3.3.7	4.6.6.11
Shield material	3.2.7	4.6.6.11
Cable component shield terminations	3.3.3.7	4.6.6.11
Overall shield terminations	3.3.4.f	4.6.6.12
Cabling	3.2.1	4.6.6.11
Tape binding	3.2.4	4.6.6.12

4.5.1.4 Quality Control Test

Inspection shall consist of the inspections specified in Table XVI. Periodic samples of each type crimped or spliced connection in the wire assembly shall be subjected to the mechanical strength test specified in 4.6.6.3, Table VII, and A-A-52416. Results of control test inspection shall be recorded and verified to meet requirements.

TABLE XVI — Quality control test inspections.

Inspection	Requirements Paragraph	Inspection Method
Pull strength (crimps)	3.3.3.11.2	4.6.6.3

4.5.1.4.1 Sampling plan.

For each type of crimped or spliced connection to be produced, one sample connection prepared in accordance with 3.3.4 (if the sample is an end connection) or 3.3.3.11.3 (if the sample is a crimp connection) shall be tested at a minimum quarterly frequency. Any change in the process, operator or tooling or settings will require testing of a new sample produced under the changed conditions.

4.1 Rejected samples.

Failure of a sample to meet the specified minimum pull strength requirement when tested in accordance with 4.6.6.3 shall be cause for rejection of all wire assemblies produced subsequent to the last acceptable pull strength test results. Production is not to resume until the cause of the failure has been corrected, as evidenced by acceptable test results obtained by testing three successively produced samples using the corrected process.

4.5.1.4.2 Rejected lots.

Wire assemblies rejected as a result of unacceptable periodic pull strength test results may be reworked by the supplier subject to corrective action specified in 4.5.1.5.1.1. Rework shall comply with drawing and specification requirements. Reworked assemblies shall be maintained in inspection lots separate from assemblies which have not been subjected to rework.

Reworked lots should be clearly identified as being reworked. One connection of each type requiring rework shall be subjected to pull strength testing to validate the effectiveness of the rework process.

4.5.2 Inspection of packaging.
The sampling and inspection of packaging shall be in accordance with the quality assurance provisions of the packaging data sheet specified by the procuring activity (see 6.2f).

4.6 Methods of inspection.

All test measurement values shall be recorded and made available to the procuring activity upon request. The following methods of inspection are acceptable as satisfying the requirements of 3.2 and 3.3.

4.6.1 Continuity.

To determine conformance to 3.4.1, circuit continuity shall be as specified on assembly drawing wiring diagram.

4.6.1.1 DC resistance.

To determine conformance to 3.4.1.1, the wire assembly shall be tested in accordance with MIL-STD-202, method 303.

4.6.1.2 Shield electrical bond.

To determine conformance to 3.4.1.2, the wire assembly shall be tested in accordance with MIL-STD-202, method 303.

4.6.2 Insulation resistance.

To determine conformance to 3.4.2, the insulation resistance shall be measured between each conductor and the remaining conductors connected together to the shield(s) and metallic shell(s), when present. Insulation resistance of the wire assembly shall be 90 megohms minimum, except the insulation resistance of a shielded conductor shall be not less than 30 megohms.

4.6.3 Dielectric strength.

To determine conformance to 3.4.3, the wire assembly shall be tested in accordance with MIL STD 202, method 301. The voltage potential shall be 500 +/ 50 volts RMS or 475 +/ 25 volts dc. The potential shall be applied between each conductor and the remaining conductors connected together to the shield (s) and metallic shell(s), when present

4.6.4 Minimum bend radii.

The wire assembly, with length of 12 inches plus the additional length required for winding on the mandrel, shall be wound tightly for two close turns around a mandrel of the diameter specified in 3.4.4. The winding may be accomplished manually and shall be in the middle portion of the wire assembly so that since six inches of each end shall remain straight. The wire assembly shall then be removed from the mandrel, examined for cracks visually without the aid of magnification, and subjected to the test specified in 4.6.3 and 4.6.1.1.

4.6.5 Environmental conditions.

4.6.5.1 Low temperature.

The wire assembly shall be placed in a temperature chamber and subjected to a low temperature test as specified in 3.4.5.1 for four hours. During the lowest operating temperature

test phase, the wire assembly shall be subjected to the tests specified in 4.6.1 and 4.6.1.1 at the start, middle and end of the four hour exposure.

4.6.5.2 High temperature.

The wire assembly shall be placed in a temperature chamber and subjected to a high temperature test as specified in 3.4.5.2 for six hours. During the highest operating temperature test phase, the wire assembly shall be subjected to the tests specified in 4.6.1 and 4.6.1.1 at the two, four and six hour intervals.

4.6.5.3 Steam and water-jet cleaning.

Install mating connector or dummy connector plugs on all electrical connectors, and subject the wire assembly to a normal steam cleaning as specified in 3.4.5.3. Immediately after water steam cleaning, the wire assembly shall be subjected to a normal water-jet cleaning as specified in 3.2.5.3. Within one hour after completing the steam and water-jet cleaning, the wire assembly shall be subjected to the tests specified in 4.6.1, 4.6.1.1 and 4.6.2.

4.6.5.4 Leakage (liquid immersion).

Install mating connector or dummy connector plugs on all electrical connectors, and subject the wire assembly to a to a leakage test as specified in 3.4.5.5. No operational tests are required during the leakage test. At the conclusion of the leakage test, the wire assembly shall be subjected to the tests specified 4.6.2. Before testing, assure connector faces are dry.

4.6.5.5 Mechanical endurance.

4.6.5.5.1 Impact, bend and twist endurance.

The wire assembly shall be subjected to a twist endurance test as specified in 3.4.5.6.4. No operational tests are required during the twist endurance test. At the conclusion of the twist endurance test, the wire assembly shall be inspected per paragraph 4.6.6.2 and subjected to the tests specified in 4.6.1, 4.6.1.1, 4.6.1.2 and 4.6.2.

4.6.5.5.2 Cold bend endurance.

The wire assembly shall be subjected to a cold bend endurance test as specified in 3.4.5.6.5. No operational tests are required during the cold bend endurance test, the wire assembly shall be inspected `per paragraph 4.6.6.2 and subjected to the tests specified in 4.6.1, 4.6.1.1, 4.6.1.2 and 4.6.2.

4.6.6 Design and construction.

To determine conformance to 3.3, components and subassemblies shall be visually inspected for completeness of assembly.

4.6.6.1 Dimensional and angular tolerances.

Tolerances shall be verified for conformance to 3.3.2 using standard inspection equipment.

4.6.6.2 Harness covering.

To determine conformance to 3.2.8, the wire assembly (types A, B, and C) shall show no evidence of material failure as defined in the following list after completion of the mechanical endurance tests per paragraphs 4.6.5.5.

a. Gaps (applies to types A and B).
b. Rips.
c. Holes.
d. Poor adhesion.

e. Sloughing, peeling or cracking (applies to types A and B).

4.6.6.3 Pull (tensile) strength.

To determine conformance to 3.3.3.4, 3.3.3.5 and 3.3.3.11.2, the crimped or spliced connection shall be attached to a standard tensile-testing machine. Sufficient force shall be applied to either: pull the conductor out of the terminal lug, or splice; or break the wire, terminal lug or splice connector. The minimum mechanical strength shall be as specified in Table VII

4.6.6.4 Ring terminals.

To determine conformance to 3.3.3.11.3, ring terminals shall be inspected as follows:

a. Visual examination of the ring terminal shall show no evidence of insulation failure or lack of sealing as follows:
   (1) Cracked, broken or damaged insulation.
   (2) Loose wire strands.
   (3) Cracked barrel.
   (4) Wire protruding more than 1 mm (0.03 inch) beyond end of barrel.
   (5) No voids, solder shall seal the barrel end.
   (6) Loose or wrinkled tubing (before or after flexing).
b. Flex wire at terminal joint. Wire close to barrel shall bend easily. Inflexibility is a sign of excessive wicking and shall be cause for rejection. Shrink tubing shall fit tightly to barrel and wire before and after flexing.

4.6.6.5 Circular metal shell connectors.

To determine conformance to 3.3.3.8 and 3.3.3.9, the circular metal shell connectors shall be tested as follows:

a. Torque requirements for applicable connectors shall be verified to be in accordance with table VI.
b. Visual and manual examination of the connector shall show no evidence of the following:
   (1) Connector assembled in violation of specification
   (2) Misarranged pins or sockets.
   (3) Connector can be completely or partially disassembled using fingers alone.

4.6.6.6 Circular resilient connectors.

To determine conformance to 3.3.3.10, tight sealing at the wire/connector interface is required. Visible voids between the connector and wire at this point or any voids created by bending or squeezing using the fingers only shall be cause for rejection (flexing wire at acute angles is not permitted). Any evidence of the use of a lubricant other than tap water during the assembly of the pins or sockets in the connector means that the connector has been improperly assembled and is not acceptable.

4.6.6.7 Crimping.

To determine conformance to 3.3.3.11.2, visual examination of crimped joints shall show no evidence of the following:

- Insulated terminals: cracks, tool inflicted damage, holes or tears.
- Uninsulated terminals: cracks or loose wire strands.

4.6.6.8 Soldering.

Conformance to 3.3.3.4 shall be determined by visual examination.

4.6.6.9 Wire stripping.

Wire strands shall be inspected visually and measured using standard inspection equipment to demonstrate conformance to 3.3.3.5.

4.6.6.10 Splicing.

Splices shall be visually inspected for conformance to 3.3.3.6

4.6.6.11 Shielding.

Type A, B and C wiring assemblies shall be visually inspected to determine conformance to 3.2.1, 3.2.7 and 3.3.3.7.

4.6.6.12 Harness Construction

Type A, B, and C wire assemblies shall be visually inspected for conformance to 3.2.4 and 3.3.4.

4.6.6.13 Identification marking.

Wire assemblies shall be visually inspected for conformance to 3.3.3.2.

4.6.6.14 Workmanship.

Wire assemblies shall be visually inspected for conformance to 3.3.12.

5. PREPARATION FOR DELIVERY

5.1 Packaging.

Packaging for the desired level of protection shall be in accordance with the packaging data sheet specified by the procuring activity (see 6.2f).

6. NOTES

6.1 Intended use.

Electrical wire assemblies manufactured in accordance with this specification are intended for use on vehicles in the A3 versions of the Bradley Fighting Vehicle (BFV).

6.2 Ordering data.

Procurement documents will specify the following:

a. Title, number, revision, and date of this specification
b. Title, number, revision, and date of part drawing
c. If first article inspection is not required (see 3.1 and 4.4).
d. Responsibility for inspection and facilities (see 4.1).
e. Quality control inspection sampling plan, if other than specified (see 4.5.1.4).
f. Level of packaging (see 4.5.2 and 5.1).
g. If the contracting officer grants prior approval, the fungus testing requirement of 4.6.5.4 may be met by engineering analysis and certification that the materials used are a non-nutrient base.
h. Any deviations from this specification.

APPENDIX A

Availability of typical wire types
MIL-W-22759 and MIL-W-81044

max. rated temperature	size range (AWG)	plating	part number
260ºC	(22-0000)	nickel	M22759/2
260ºC	(22-00)	nickel	M22759/3
260ºC	(22-4)	nickel	M22759/6
260ºC	(22-4)	nickel	M22759/8
260ºC	(22-8)	nickel	M22759/12
260ºC	(22-8)	nickel	M22759/29
200ºC	(22-00)	nickel	M22759/41
200ºC	(22-12)	nickel	M22759/45
200ºC	(22-0000)	silver	M22759/1
200ºC	(22-00)	silver	M22759/4
200ºC	(22-8)	silver	M22759/11*
200ºC	(22-8)	silver	M22759/28
200ºC	(22-12)	silver	M22759/43
200ºC	(22-12)	silver	M22759/44
150ºC	(22-0)	tin	M81044/6
150ºC	(22-0)	tin	M81044/9*
150ºC	(22-12)	tin	M81044/12

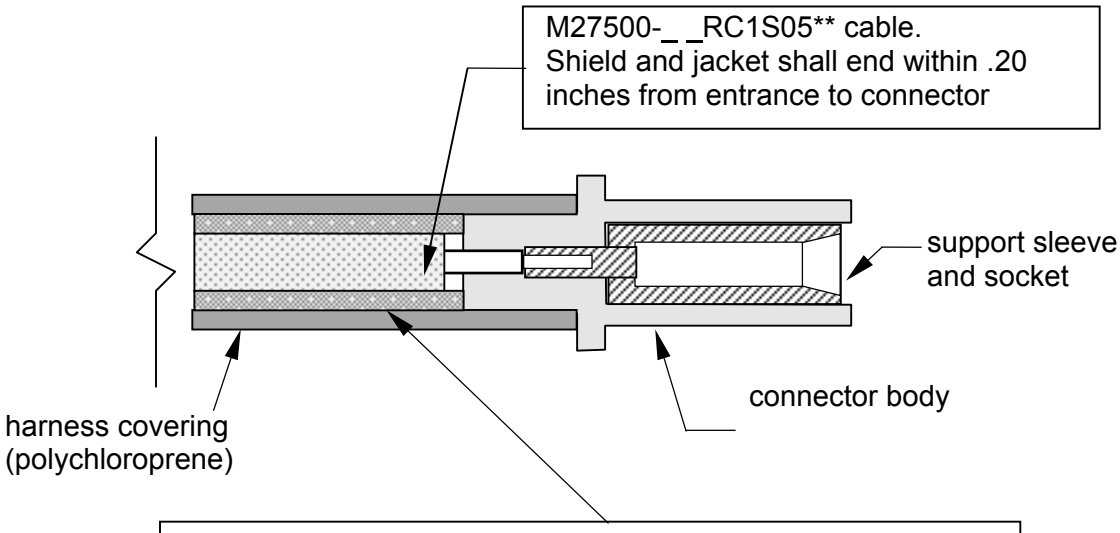
A few of these types (*) are available off-the-shelf in sizes 22 to 12 AWG. Manufacturers will require a large order and/or fee to be persuaded to set-up tooling for production of other types and sizes. The smallest size allowed for single wire on Bradley Fighting Vehicles is 22 AWG.

APPENDIX B

HARNESS ASSEMBLY GUIDE
for
Connector, Male, Single Contact, Automotive, Rubber Backshell

MALE connector	AWG 16	AWG 14	AWG 12
shell part no.	8338561-2	8338561-1	8724494
contact (socket)	8338564*	8338564	8338564
support sleeve	8338562	8338562	8338562

* wire filler for 16 AWG wire is recommended for crimp strength.



Shrink tubing, M23053/1, Class 2, layers and lengths as required, and compatible adhesive as required to prevent connector backshell separation from harness when harness jacket is grasped and tested with a straight pull on a mated connector. Connectors shall demate with no apparent damage to assembly. Mating surfaces shall be free of lubricating compounds during test.

** Blank space indicates wire gage in MIL-C-27500 cable.

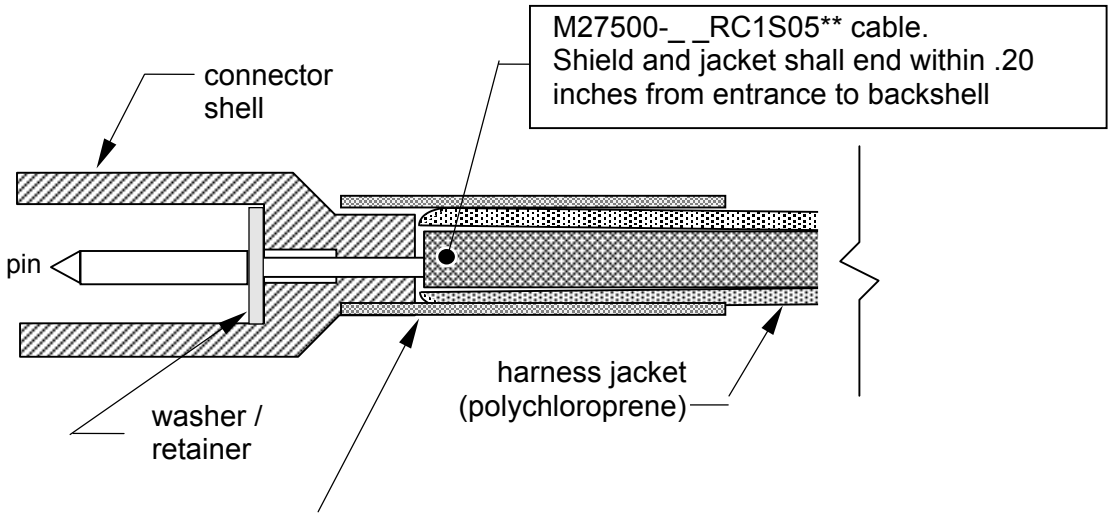
Data for both connector genders.

Wire Opening Dimensions	AWG 16	AWG 14	AWG 12
wire opening	.069	.083	.115
ideal fit wire diameter.	.078 ±.003	.097 ±.004	.135 ±.010
M22579/11 wire diameter.	.075 ±.002	.090 ±.002	.111 ±.003
cable part # M27500-	16RC1SO5	14RC1SO5	12RC1SO5

APPENDIX B (continued)

HARNESS ASSEMBLY GUIDE
for
Connector, Female, Single Contact, Automotive, Rubber Backshell

FEMALE connector	AWG 16	AWG 14	AWG 12
shell part no.	8338566-2	8338566-1	8724495
contact (pin)	AA52536-3	AA52536-2	AA52536-1
washer, retainer	8338567-1	8338567-2	8338567-2



** Blank space indicates wire gage in MIL-C-27500 cable.

Data for both connector genders:

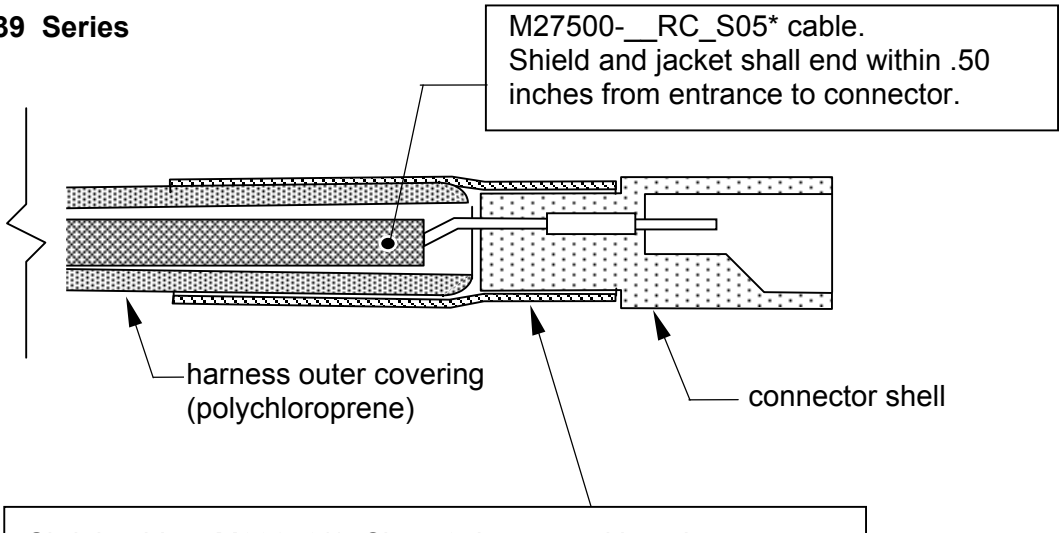
Wire Opening Dimensions	AWG 16	AWG 14	AWG 12
wire opening	.069	.083	.115
ideal fit wire diameter.	.078 ±.003	.097 ±.004	.135 ±.010
M22579/11 wire diameter.	.075 ±.002	.090 ±.002	.111 ±.003
cable part # M27500-	16RC1SO5	14RC1SO5	12RC1SO5

APPENDIX C

HARNESS ASSEMBLY GUIDE
for
Connector, Rubber Shell
"Packard Type"

Receptacle

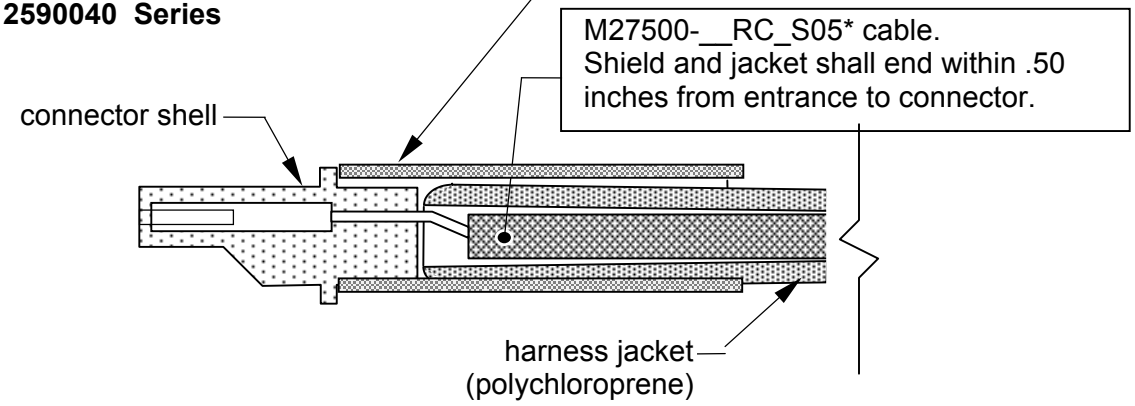
80064 - 2590039 Series



Shrink tubing, M23053/1, Class 2, layers and lengths as required, and compatible adhesive as required to prevent connector backshell separation from harness when harness jacket is grasped and tested with a straight pull on a mated connector. Connectors shall demate with no apparent damage to assembly. Mating surfaces shall be free of lubricating compounds during test.

Plug

80064 - 2590040 Series



* Blank spaces indicate wire gage and number of wires in MIL-C-27500 cable.